Influenza and influenza vaccination in children

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Abstract

Ecological and active population-based surveillance studies have clearly shown the large burden of influenza disease in children, both in hospital and outpatient settings. Mortality and encephalitis due to influenza have also been reported. Two vaccines are licensed for use in children; trivalent inactivated and live attenuated vaccines. Both have been shown to be efficacious for the prevention of clinically and laboratory-confirmed influenza. In recent comparative trials in young children, live attenuated vaccines were shown to be more effective than trivalent inactivated vaccines for the prevention of laboratory-confirmed influenza. However, episodes of wheezing were increased in the youngest children receiving live attenuated vaccine. Trivalent inactivated influenza vaccine has an excellent safety profile and has been mainly associated with local pain and tenderness at the injection site. Vaccine efficacy for the inactivated vaccine has been shown to be greater in older children. Increased use of either influenza vaccine has the potential to reduce the disease burden in children and to extend herd protection to those who are not vaccinated.

Introduction

Over the past several years a number of ecological studies have demonstrated the excessive burden of influenza disease in children [1, 2]. Izurieta et al. [1] used local viral surveillance to define periods when the circulation of influenza viruses predominated over that of respiratory syncytial virus (RSV) and calculated rates of hospitalization for acute respiratory disease in children younger than 18 years of age enrolled in two large health maintenance organizations (HMO). Among children without high-risk conditions, hospitalization rates in children younger than 2 years of age were 231 per 100,000 person-months in one HMO and 193 per 100,000 person-months in the other. In children 5–17 years of age, rates were 19 per 100,000 person-months in one HMO and 16 per 100,000 person-months in the other. Finally, among high-risk children 5–17 years of age, hospitalization rates were 386
per 100,000 person-months and 216 per 100,000 person-months in the two HMOs, respectively.

In another ecological study, Neuzil et al. [2] assessed the influenza burden in a large cohort of children less than 15 years of age enrolled in the Tennessee Medicaid program. Over a period of 19 years and a total of 2,035,143 person-years of observation, the average number of hospitalizations each year for cardiopulmonary conditions attributable to influenza was 10.4 per 1000 children younger than 6 months of age, 5.0 per 1000 for those 6–12 months, 1.9 per 1000 for those 1–3 years, 0.9 per 1000 for those 3–5 years, and 0.4 per 1000 for those 5–15 years. In addition, for every 100 children there were an average of 6 to 15 outpatient visits and 3 to 9 courses of antibiotics attributable to influenza disease each year [2].

Recently rates observed in these ecological studies were confirmed through an active, prospective, population-based surveillance network [3–5]. Children younger than 5 years of age residing in three United States counties were enrolled during hospitalizations or either outpatient or emergency department visits for acute respiratory tract infections or fever. Nasal and throat swabs were tested for the influenza virus by viral culture and polymerase chain reaction assay and epidemiological data were collected [5]. Combining data from four influenza seasons, the average annual hospitalization rates associated with influenza were 0.9 per 1000 children (Tab. 1). The rates were 4.5 per 1000 children less than 6 months of age, 0.9 per 1000 children 6–23 months of age, and 0.3 per 1000 children 24–59 months of age. The estimated burden of outpatient and emergency department visits associated with influenza was even greater and depended upon the severity of the influenza season (Tab. 2). During 2 years of outpatient surveillance there were between 50 and 95 clinic visits and 6–27 emergency department visits per 1000 children per year. Remarkably, only 28% of the hospitalized children with laboratory confirmed influenza and only 17% of those seen in the outpatient settings with confirmed influenza were diagnosed with influenza by their treating physician. This is despite the usefulness of rapid diagnostic tests for the confirmation of influenza in young children [6–9].

Population-based estimates from other US studies have provided comparable rates using different study years, populations, and study methods [10–16]. Additional studies of influenza burden in children have also been conducted in other countries. Montes et al. [17] determined the incidence of virologically confirmed influenza-related hospitalizations in children aged <5 years in southern Spain during three study years. Their average yearly hospitalization rates were 4.1 per 1000 children less than 6 months of age, 0.8 per 1000 children aged 6–11 months of age, 0.7 per 1000 children 12–23 months of age, and 0.5 per 1000 children aged 24–59 months. These rates are nearly identical to those reported by Poehling et al. [5]. In a retrospective, population-based study, Chiu et al. [18] determined the annual laboratory-confirmed influenza-associated hospitalization rates among children 15 years old or younger who lived in Hong Kong. The adjusted rates of